

## Special Weapons Observation Remote recon Direct Action System (SWORDS)

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### **ABSTRACT**

*After leading a 4-man robotic search and rescue team at the World Trade Center, a Non-Commissioned Officer (NCO) was requested by the U.S. Army Tank-Automotive Research, Development and Engineering Center (TARDEC) to perform a “proof of concept” in arming a Talon robot. The NCO’s choice of armament was the M202 rocket launcher.*

*After the success of the “proof of concept”, the U.S. Army Armament Research, Development and Engineering Center (ARDEC) leadership asked the NCO if he had any other ideas on arming unmanned ground vehicles (UGV’s). The NCO came up with three ideas: 1. Improve the M202 rocket launcher with its own fire control and electric firing pins, 2. A six (6) barreled 40mm grenade launcher, and 3. The SWORDS.*

*The SWORDS was seen as a very risky endeavour, in cost and schedule, so the NCO enlisted the support of the Associate Technical Director of the U.S. Armament Research, Development and Engineering Center (ARDEC). With the ARDEC Associate Technical Director’s support the program was fully funded and in the summer of 2003, the NCO and his soldiers demonstrated all three variants to the Special Operations Command at Avon Park Bombing Range, Florida with great success. The SWORDS idea was created by a NCO for soldiers on the battlefield. Today, a Non-Commissioned Officer is the technical manager of the SWORDS program.*

*The Special Weapons Observation Remote recon Direct Action System (SWORDS) is a spiral developmental program consisting of three spirals. Spiral 1.0 is a combination of Commercial-Off-The-Shelf (COTS) systems that include the EOD Talon robot (used for bomb disposal) and the Tele-present Rapid Aiming Platform (TRAP) weapon mount. Spiral 1.5 which is currently undergoing safety confirmation testing at Aberdeen Proving Ground includes the addition of a M240B machine gun, a roll stop LED on the Operator’s Control Unit (OCU) and a laser range finder. Spiral 2.0 is currently in system definition and may include a 360 degree weapon mount among various other technology upgrades.*

*Foster-Miller, Inc., a QinetiQ Company, is the contractor for SWORDS. Foster-Miller, Inc. integrated the TRAP weapon system onto the Talon 3B chassis, creating the SWORDS. The SWORDS is the first weaponized unmanned ground vehicle.*

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*The SWORDS is equipped with a “kill device” that provides the OCU operator the ability to terminate the robot’s mobile platform battery power, if necessary. This is an extraordinary safety feature. The kill device transmits on a continuous signal between the kill button located on the user module and the vehicle module located on the mobile platform.*

*The SWORDS robot provides a safe, controlled, and superior countermeasure to small arms threats and is the ultimate tool in force protection and projection. The SWORDS provides surveillance, facility security, reconnaissance and has the ability to secure areas without direct soldier exposure. With its long-range accuracy, precision lethality, and variable response, the SWORDS is ideal for peacekeeping, offensive, and defensive applications.*

*The SWORDS is a mobile, lightweight, self-contained system that can be deployed and remotely operated by an individual Soldier with an optional link to his command post. The SWORDS can be used for perimeter security, where several SWORDS platforms can be incorporated into a powerful perimeter security network.*

*The SWORDS is highly maneuverable as it can climb a four inch curb. The unmanned armed robot weighs approximately 200 pounds. The robot’s platform, the Talon, is equipped with a lithium-ion battery which provides a four hour operating life.*

*The SWORDS has been used in military experiments acting both in primary and secondary roles. The weaponized unmanned ground vehicle participated in the SOCOM experiment at Camp Roberts, CA in June 2006. The robot was integrated with the Family of Integrated Rapid Response Equipment (FIRRE) in the Comprehensive Force Protection Initiative (CFPI) experiment at Yuma Proving Ground (YPG) in September 2006. The SWORDS participated in Ft. Benning’s Air Assault Expeditionary Force (AAEF) in October 2006.*

*As a superior small arms defensive system, the SWORDS offers reliable strike capability. For small arms, the SWORDS gives peacekeeping forces the ability to operate among non-combatants and provide an unprecedented degree of protection both for operation personnel and local populations. In addition, the SWORDS offers a stepped response should the peacekeeping operation turn hostile.*

*As a defensive system for serious small arms actions, the SWORDS has a magnified effect simply because it changes the status quo for modern firepower. A modern small arms engagement classically uses heavy suppressive fire for cover and movement. The expected effect is to force defenders to seek cover and thus eliminate the possibility of their aimed response.*

*The SWORDS is both immune to suppression and sets unprecedented high standards for accuracy and speed while remaining directly in the face of enemy fire. The SWORDS can augment the Infantry Company, Platoon, and Squad in their accomplishment of combat tasks while minimizing risk to the unit conducting these types of operations. As with any other combat multiplier, overwatch of the SWORDS while it conducts these types of operations must still be maintained.*

*Currently there is no system that reduces the exposure of an Infantryman to enemy small arms fire while also conducting offensive and defensive operations. The SWORDS can be left exposed to draw enemy fire while it engages the enemy force, thus it greatly enhances the unit’s capability to simultaneously find, fix and defeat the enemy.*

*The Government-Industry team that developed the SWORDS system has successfully integrated the following individual Infantry weapons onto the Talon robot: the 5.56mm M249 Squad Automatic Weapon and the*

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*7.62mm M240B Machine Gun. In the process, the team successfully addressed integration issues related both to the mounting of the weapon onto the Talon, as well as the remote operation of the weapon.*

*Some of the primary integration issues that had to be addressed were: attaching the TRAP weapon platform to the Talon chassis to ensure stability of the weapon platform, placing the five cameras so that the operator has an adequate field of view, integration of operator controls into the Talon OCU, integrating the TRAP electronics into the electronic control system of the Talon robot, and implementation of safety features. Safety attributes are both physical controls that require a specified encrypted string of commands to be sent in order to enable firing and data communication protocols.*

*Operational Concept Demonstrations and limited functional and safety evaluations were performed starting in 2003 and continue to today. Further prototype testing was performed in 2004 and 2005. Testing activities demonstrated the operation viability of the armed robot concept. These demonstrations and initial evaluations also raised issues and challenges that would need to be addressed in later refinements to the concepts of developing safe and functional armed robot systems.*

*The primary concerns that emerged from the testing activities were: arrangement of controls on the OCU to increase user-friendliness, avoid interference between systems, provide situational information to the operator, durability of controls, communication hardware, weapon mounts, and tracks, repositioning and adding camera, redesign of the trigger actuator to accommodate a higher volume of fire and facility for shell ejection. These issues were addressed in the subsequent development work that was done on the SWORDS in 2005. The Operational Concept Demonstrations led to further development efforts.*

*The SWORDS recently underwent proving ground testing that provided the system a safety confirmation. As a result of its recently obtained safety confirmation, the XM1154 SWORDS will soon be the first armed unmanned ground robot to transition from full systems development, through safety testing, and will be urgently materiel released for operational evaluations in actual combat missions.*

*The SWORDS robot provides our dismounted Infantry with unprecedented firepower. This small and mobile weapon platform will greatly enhance the firepower of our forces in combat while significantly enhancing the protection of our Soldiers and Marines.*

*The SWORDS platform can be operated on all-terrain, such as mud, sand, rubble-type obstacles, six -inch deep water and in all-weather conditions. It has the ability to convey reliable images for reconnaissance and for engaging personnel and material targets day and night.*

*The SWORDS is controllable in wireless RF mode and in tethered control mode. In RF Communication control mode, the system shall provide the operator with full control of all system function at a distance up to 800 meters line-of-sight without any performance degradation. RF Communication mode shall utilize frequency hopping and spread spectrum to meet military requirement.*

*The Operator's Control Unit (OCU) requires no maintenance except for cleaning the screen and the replacement of the battery at specified intervals or when found to be deficient by the operator during serviceability test. The batteries are field level replaceable and require no special tools or equipment. The OCU design allows for testing, operation and maintenance by the 5<sup>th</sup> to 95<sup>th</sup> percentile environmentally clothed soldier.*

*The SWORDS operator remotely controls the ground vehicle's five cameras. Two of the cameras are equipped with Generation 3 night vision capability. The cameras allow the U.S. Warfighter to engage the enemy while*

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*remaining invisible from them. U.S. Warfighter lives will be save during urban combat, perimeter security, dismounted patrols and security checkpoints operations.*

*The SWORDS provides sniper capability and increases weapon accuracy. The robot is extremely mobile and compact as it can be transported from one location to another in three carrying cases.*

*There are no restrictions regarding presentation neither during the symposium nor of the publication of the paper in the Meeting Proceedings.*

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## **1.0 SWORDS PUBLICATION**

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